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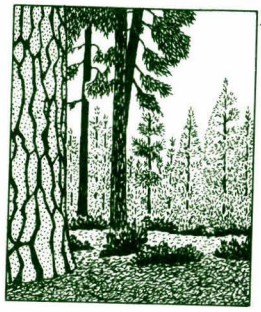
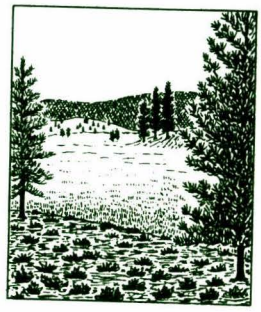


FOREST RESEARCH NOTES

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
KEITH ARNOLD, DIRECTOR

U.S. DEPARTMENT OF AGRICULTURE – FOREST SERVICE



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RICE HULLS IMPROVE DRILLING OF BITTERBRUSH SEED[1/]

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Bitterbrush, a key browse species on many deer-winter ranges in the West, can be established on suitable range sites by direct seeding if animal use is controlled to permit development and survival of the seedlings. But, as anyone who has tried it knows, seeding equipment can cause some headaches. Drilling bitterbrush seed at the usual low planting rates is troublesome by ordinary methods and equipment. An erratic seedling distribution is likely to result when standard grain drills are used. All too often special equipment to do a satisfactory job is unavailable when needed or too costly to move to the planting site.

We have found that a standard grain drill can be used if the bitterbrush seed is mixed with rice hulls. This note describes tests in which fluted-feed grain drills were calibrated for various bitterbrush seeding rates using rice hulls as carriers, and it presents a planting chart and operating hints.

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1/ Contribution from cooperative investigation of the Forest and Range Experiment Station and the Department of Fish and Game. Work was done under Federal Aid in Wildlife Restoration Act, Pittman-Robertson Research Projects W46R and W51R, entitled "Game Range Restoration."

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The California Forest and Range Experiment Station is maintained at Berkeley in cooperation with the University of California.

Neither the problem nor the idea are new. Lemmon and Hafenrichter[2/] and Hoglund [3/] have used barley and rice hulls. Hoglund reported rice hulls were somewhat superior as a seed carrier or diluent. He found that uniform seeding rates and correct proportions of different seeds were better maintained by mixing the seeds with rice hulls than with other materials.

Seed Distribution Tests

Bitterbrush seed graded over a 6/64-inch screen and loose rice hulls were mixed in a ratio of three to eight for planting through a John Deere-Van Brunt Model FB 177A, 18 x 7 grain drill. The main hopper was filled to two-thirds capacity with this mixture, and the seed agitators disengaged. The feed regulator was set at 21 notches (equivalent to 88 pounds of barley per acre) and the feed gates adjusted to position 2. The drive wheels were jacked off the floor and containers placed under the grain feeds to collect the sown material. The wheels were rotated by hand at between 2 and 3 miles per hour, a sufficient number of revolutions to equal the distance covered in sowing 0.1 acre. One preliminary trial was made to insure the proper functioning of the equipment. The drilled mixture was collected and weighed after each of 10 tests. Each time the seed was separated from the hulls and weighed to determine the proportion of seed to hulls.

Drilling rates ranged from 7.2 to 6.4 pounds of bitterbrush seed per acre and averaged 6.8 (table 1). The proportion of seed in the total mixture varied 4 percent or less between tests. Mixing the bitterbrush seed with rice hulls was credited with these satisfactory seeding rates.

Generally a higher proportion of seed was drilled than was contained in the mixture. Before drilling, the seed made up 27.2 percent of the mixture; afterward it was from 30 to 34 percent of the drilled material. The seed probably separated from the hulls during the mixing, pouring, and drilling operations. Nevertheless the ratio of seed to hulls remained sufficiently constant in these tests to give satisfactory uniform seeding rates.

Agitation Hastens Seed Separation

To further test the effect of stirring or agitating upon the rate and distribution of sown seed, the agitators were engaged. The main hopper was again filled to two-thirds capacity with the same seed-hull mixture and the drill operated under the same conditions of the previous tests.

2/ Lemmon, Paul E., and Hafenrichter, A. L. The dilution method for plot or field seeding of grasses and legumes alone or in mixtures. Jour. Amer. Soc. Agron. 39:817-21. 1947.

3/ Hoglund, Oswald K. Seed dilution with rice hulls. U.S. Soil Conserv. Serv., Regional Nursery Div., Pleasanton Nursery Unit. Proc. 1 p. 1948

Table 1.--Seeding rate and proportion of bitterbrush seed in 8:3 mixture of rice hulls and seed drilled with and without seed box agitators

Seed agitator disengaged				Seed agitator operating			
	Seeding rate per acre				Seeding rate per acre		
Test	Total mixture	Bitterbrush seed	Bitterbrush seed in mixture	Test	Total mixture	Bitterbrush seed	Bitterbrush seed in mixture
	Pounds		Percent		Pounds		Percent
1	21.8	6.4	29.8	11	20.7	6.4	31.0
2	22.2	7.2	32.2	12	21.1	5.1	24.4
3	21.3	7.1	33.2	13	19.2	4.4	22.8
4	20.8	6.9	33.1	14	18.4	3.8	20.4
5	20.9	6.9	32.7	15	18.3	5.3	18.9
6	20.8	6.9	33.0	16	17.7	4.9	17.7
7	20.8	7.0	33.5	17	18.0	3.0	16.6
8	21.2	6.9	32.5	18	18.1	3.3	18.4
9	20.8	6.8	32.7	19	18.1	3.0	16.7
10	20.3	6.4	31.3	20	18.0	3.2	17.9
Average	21.2	6.8	32.4	Average	18.6	4.2	20.8

An entirely different pattern resulted. Seeding rates dropped rapidly to 3.0 pounds per acre (table 1) and the ratio of seed to drilled material was erratic. At the start, the bitterbrush seed made up 31 percent of the mixture but it declined to less than 20 percent with drilling.

What caused the undesirable effect of agitators? The reason is that bitterbrush seeds, unlike the smaller seeds such as clovers and some grasses, are not contained by the hull-cups but merely "suspended" by the mass of hulls. Consequently they separate if stirred or agitated.

Field Calibration Tests

To determine drill settings for sawing seed-hull mixtures, calibration tests were run in the field. A John Deere-Van Brunt Model B, 20 x 6 grain drill was used. Plastic bags were attached to the base of the loosened grain tubes to collect the sown material. Two tests were made over a 435.6-foot course (0.1 acre) at drill settings of 8, 12, 16, 20 and 24 notches. The drilled material was weighed at the end of each test. Seeding rates ranged from 1.86 to 6.09 pounds per acre (table 2), from the lowest to highest setting, but only minor differences occurred between tests at each individual setting.

Table 2.--Amounts of bitterbrush seed distributed at various drill settings in calibration tests

Drill settings		Pounds of seed distributed per acre		
Notches	Pounds per acre[1] on barley scale	Test 1	Test 2	Average
8	--	2.0	1.8	1.86
12	44	2.6	2.5	2.54
16	61	3.5	3.2	3.34
20	77	4.5	4.6	4.58
24	89	6.1	6.1	6.09
28	112	---	---	[2]8.30

1/ From a manufacturer's chart for planting barley.
2/ Planting rate from 4-acre pilot seeding trials.

Bitterbrush Planting Chart

The planting chart shown in figure 1 was developed from these tests to give bitterbrush drilling rates at the various regulator settings. Proper drill settings for seeding rates ranging from 2 to 8 pounds per acre can be read from the chart.

Operating Hints

The difficulties that may develop while drilling seed mixed with rice hulls have already been pointed out. Nearly all are caused by failure to make necessary adjustments and follow instructions. Careful attention to the following points will result in a better planting job:

1. Use a constant ratio of clean, well-graded seed and rice hulls: 3 to 8 proportions are recommended.

2. Disengage the seed agitators in the drill box.

3. Adjust both the feeds and gate openings to the proper setting for drilling the quantity desired.

4. Distribute the seed mixture evenly in the drill hopper.

5. Make necessary adjustments for variations that may arise during drilling.

Extensive browse seedings can supplement other range inprovement porgrams just as grass seedings have. The success of such plantings will depend in part on the equipment used. Standard fluted-feed type drills equipped to control depth and rate of planting are well adapted and can be used for planting bitterbrush seed mixed with rice hulls. Good stands of bitterbrush have resulted from direct seedings on suitable sites when animal grazing was effectively controlled during early plant development.

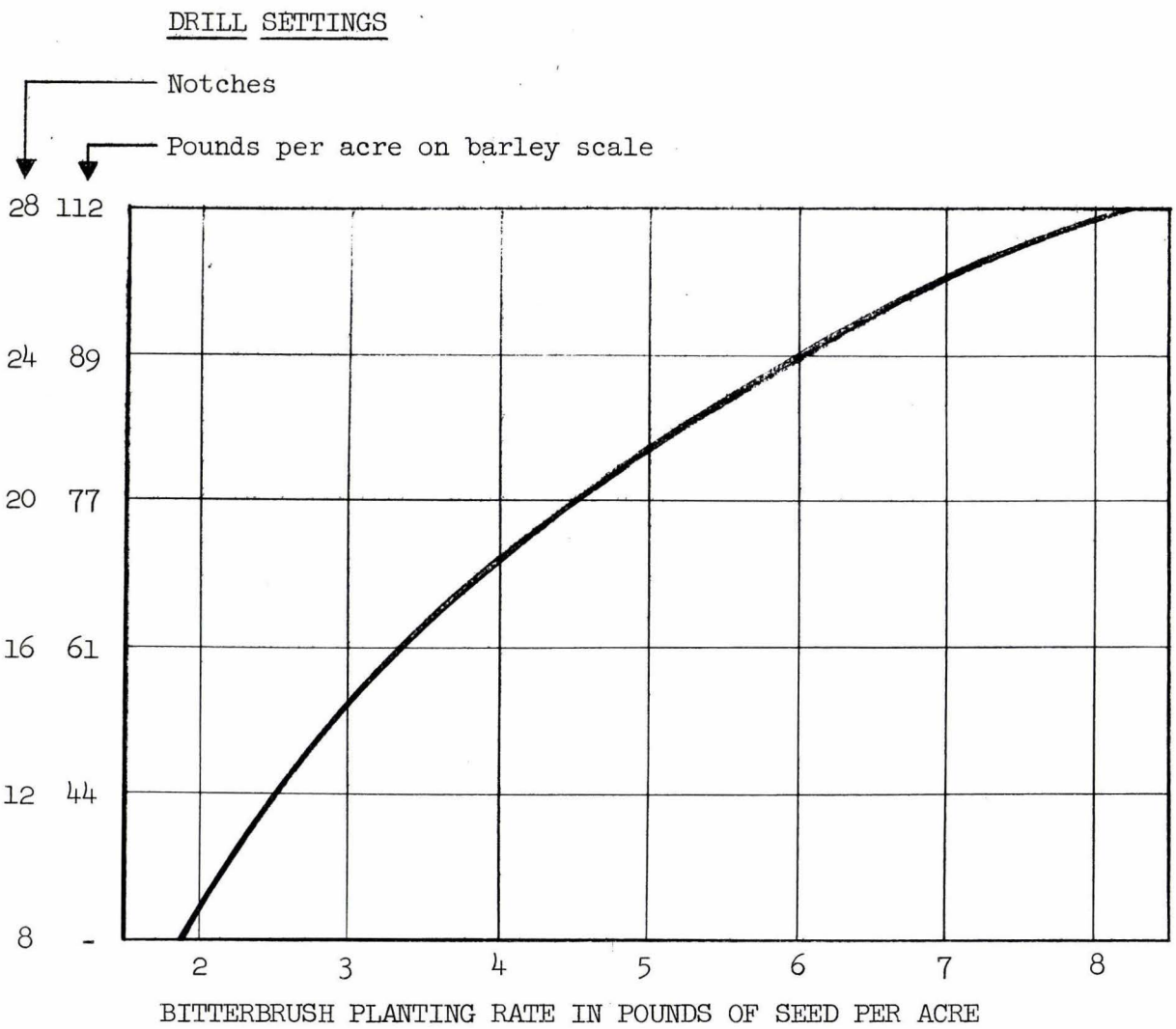

Figure 1.-Planting chart for bitterbrush seed rice hull mixture pounds per acre.